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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Parker et al.	Examiner:	Johnston, P.
Serial No.:	10/077,036	Group Art Unit:	2881
Filed:	2/15/2002	Docket:	SJO919990205US1 (IBMS.009US01)
Title:	METHOD AND APPARATUS FOR COMPENSATING WAVEFORMS, SPECTRA, AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT		

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence and the papers, as described hereinabove, are being deposited in the United States Postal Service, as first class mail, in an envelope addressed to: Board of Patent Appeals and Interferences, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450, on June 13, 2005.

By: David W. Lynch

APPEAL BRIEF

Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an Appeal Brief submitted pursuant to 37 C.F.R. § 41.37 for the above-referenced patent application. Please charge Deposit Account No. 50-0563 (**SJO919990205US1**) in the amount of $500.00 for this brief in support of appeal as indicated in 37 C.F.R. § 41.20(b)(2). If necessary, authority is given to charge/credit deposit account 50-0996 (IBMS.009US01) any additional fees/overages in support of this filing.

I. Real Party in Interest

The real party in interest is International Business Machines Corporation, having a place of business at New Orchard Road, Armonk, New York 10504. This application is assigned to International Business Machines Corporation.

II. Related Appeals and Interferences

Appellants are unaware of any related appeals, interferences or judicial proceedings.

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III. Status of Claims

Claims 70-147 were rejected. Claims 70-109, 111-127 and 129-147 are presented for appeal and may be found in the attached Appendix of Appealed Claims in their present form.

IV. Status of Amendments

An amendment combining claim 105 with 110 and claims 128 with 129 accompanies this appeal so as to remove claim 110 and 128 from appeal. No further amendments to the claims were made subsequent to the final rejection of Appellants' application.

V. Summary of Invention

A method and apparatus for compensating waveforms, spectra, and profiles derived therefrom for effects of drift. In independent claim 70, a spectral processing method for compensating a plurality of sequential spectra (page 33, lines 4-6; Fig. 2) and profiles derived therefrom for effects of drift of data along an independent variable axis (page 46, line 12; 504 in Fig. 5) is recited. More specifically, a plurality of sequential spectra (page 33, lines 4-6; Fig. 2) obtained from a spectrometer (page 90, line 4, 1910 in Fig. 19) are transformed (page 40, lines 17-22; 412 in Fig. 4) to provide an array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along an independent variable axis (page 46, line 12; 504 in Fig. 5). The array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along the independent variable axis (page 46, line 12; 504 in Fig. 5) constitutes a drift-compensated array. A principal-factor determination (page 39, line 5; 452 in Fig. 4) is performed on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5). From a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) lying within a space of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5), scaled target-factor profiles compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) are generated (page 39, lines 7-9, 454 in Fig. 4).

In independent claim 89, a waveform processing method for compensating a plurality

of sequential waveforms and profiles derived therefrom for effects of drift is presented. A plurality of sequential waveforms obtained from a waveform-source device are transformed (page 40, lines 17-22; 412 in Fig. 4) to provide an array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along an independent variable axis (page 46, line 12; 504 in Fig. 5). The array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along an independent variable axis (page 46, line 12; 504 in Fig. 5) constitutes a drift-compensated array. A principal-factor determination (page 39, line 5; 452 in Fig. 4) on the drift-compensated array is performed to provide a set of principal factors compensated for effects of drift of data along an independent variable axis (page 46, line 12; 504 in Fig. 5). From a profile trajectory of the row vectors lying compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) within a space of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5), scaled target-factor profiles compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) are generated (page 39, lines 7-9, 454 in Fig. 4).

In independent claim 105, as presented for appeal, an apparatus for compensating a plurality of sequential spectra (page 33, lines 4-6; Fig. 2) and profiles derived therefrom for effects of drift comprising a spectroscopic analysis system, wherein the spectroscopic analysis system is provided. The apparatus includes a spectrometer (page 90, line 4, 1910 in Fig. 19) and a computer system (page 90, line 5; 1920 in Fig. 19), coupled to the spectrometer (page 90, line 4, 1910 in Fig. 19), for analyzing spectra input from the spectrometer (page 90, line 4, 1910 in Fig. 19), the computer system (page 90, line 5; 1920 in Fig. 19) further comprising a spectral processor (page 90, line 7, 1940 in Fig. 19) for compensating a plurality of sequential spectra (page 33, lines 4-6; Fig. 2) and profiles derived therefrom for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along an independent variable axis (page 46, line 12; 504 in Fig. 5). The spectral processor (page 90, line 7, 1940 in Fig. 19) further includes a spectral transformer (page 91, lines 23-24; 1970 in Fig. 19) operating on a plurality of sequential spectra (page 33, lines 4-6; Fig. 2) obtained from the spectrometer (page 90, line 4, 1910 in Fig. 19) to provide an array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12

for Fig. 7) along the independent variable axis (page 46, line 12; 504 in Fig. 5), wherein the array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along an independent variable axis (page 46, line 12; 504 in Fig. 5) constitutes a drift-compensated array. The spectral processor (page 90, line 7, 1940 in Fig. 19) further includes a principal-factor determinator (page 93, lines 9-10; 1980 in Fig. 19) operating on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5). The spectral processor (page 90, line 7, 1940 in Fig. 19) also includes a profile generator (page 93, lines 9-10; 1990 in Fig. 19) operating on a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) lying within a space of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) to provide a set of scaled target-factor profiles compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5).

In independent claim 129, as presented for appeal, an apparatus for compensating a plurality of sequential waveforms and profiles derived therefrom for effects of drift, comprising a waveform analysis system, wherein the waveform analysis system is provided. The apparatus includes a waveform-source device and a computer system (page 90, line 5; 1920 in Fig. 19), coupled to the waveform-source device, for analyzing waveforms input from the waveform-source device, the computer system (page 90, line 5; 1920 in Fig. 19) further comprising a waveform processor for compensating a plurality of sequential waveforms (page 33, lines 4-6; Fig. 2) and profiles derived therefrom for effects of drift of data along an independent variable axis (page 46, line 12; 504 in Fig. 5). The waveform processor further includes a waveform transformer operating on a plurality of sequential waveforms (page 33, lines 4-6; Fig. 2) obtained from a waveform-source device to provide an array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along the independent variable axis (page 46, line 12; 504 in Fig. 5). The array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along the independent variable axis (page 46, line 12; 504 in Fig. 5) constitutes a drift-compensated array. The waveform process also includes a principal-factor determinator (page 93, lines 9-10; 1980 in Fig. 19) operating on the drift-

compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5). The waveform process further includes a profile generator (page 93, lines 9-10; 1990 in Fig. 19) operating on a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) lying within a space of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) to provide a set of scaled target-factor profiles compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5).

In independent claim 145, an article of manufacture comprising a program storage medium readable by a computer, the medium tangibly embodying one or more programs of instructions executable by the computer to perform a method for compensating a plurality of sequential spectra (page 33, lines 4-6; Fig. 2) and profiles derived therefrom for effects of drift is presented. The method includes transforming a plurality of sequential spectra (page 33, lines 4-6; Fig. 2) obtained from a spectrometer (page 90, line 4, 1910 in Fig. 19) to provide an array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along an independent variable axis (page 46, line 12; 504 in Fig. 5), wherein the array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along the independent variable axis (page 46, line 12; 504 in Fig. 5) constitutes a drift-compensated array. A principal-factor determination (page 39, line 5; 452 in Fig. 4) is performed on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5). From a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) lying within a space of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5), scaled target-factor profiles compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) are generated (page 39, lines 7-9, 454 in Fig. 4).

In independent claim 147, an article of manufacture comprising a program storage medium readable by a computer, the medium tangibly embodying one or more programs of instructions executable by the computer to perform a method for compensating a plurality of sequential waveforms (page 33, lines 4-6; Fig. 2) and profiles derived therefrom for effects of

drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) is presented. The method includes transforming a plurality of sequential waveforms (page 33, lines 4-6; Fig. 2) obtained from a waveform-source device to provide an array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along an independent variable axis (page 46, line 12; 504 in Fig. 5), wherein the array of row vectors compensated for effects of drift of data (page 46, line 6 for Fig. 5; page 49, line 12 for Fig. 7) along the independent variable axis (page 46, line 12; 504 in Fig. 5) constitutes a drift-compensated array. A principal-factor determination (page 39, line 5; 452 in Fig. 4) is performed on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5). From a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) lying within a space of principal factors compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5), scaled target-factor profiles compensated for effects of drift of data along the independent variable axis (page 46, line 12; 504 in Fig. 5) are generated (page 39, lines 7-9, 454 in Fig. 4).

VI. Grounds of Rejection

Appellant has attempted to comply with new rule 37 C.F.R. § 41.37(c) by providing the Office Action's grounds of rejection verbatim, followed by an argument section corresponding thereto.

A. **Claims 70-88, 105-127, and 145-147 were rejected under § 103(a) over Haaland (U.S. Patent Pub. No. 2002/0059047) in view of Obremski (U.S. Patent No. 5,498,875).**

B. **Claims 89-104, and 128-144 were rejected under § 103(a) over Haaland, in view of Obremski and in further view of Ito (U.S. Patent No. 6,393,368).**

VII. Argument

A. CLAIMS 70-109, 111-127 AND 129-147 ARE PATENTABLE OVER HAALAND (U.S. PATENT PUB. NO. 2002/0059047) IN VIEW OF OBREMSKI (U.S. PATENT NO. 5,498,875) AND IN FURTHER VIEW OF ITO (U.S. PATENT NO. 6,393,368).

1. Haaland, Obremski And Ito Fail To Disclose, Teach Or Suggest the Limitations of Independent Claims 70, 89, 105, 129, 145 and 147.

a. Haaland, Obremski And Ito fail to disclose, teach, or suggest "transforming a plurality of sequential spectra obtained from a spectrometer."

The Final Office Action asserts that Haaland discloses the elements of the independent claims. Obremski is merely cited as allegedly teaching a number of available spectral analysis software packages. Ito is merely cited as disclosing waveform factor analysis along the time axis.

Appellant's respectfully traverse the rejections. The Examiner considers repeat samples to be sequential spectra. However, Haaland at [0031] defines repeat sample by: "The best single repeat sample is generally the sample representing the center of the calibration space." Accordingly, from this it is clear that "repeat sample" is a "sample," not a spectrum. Moreover, it is a sample from the calibration space, and therefore, a calibration sample. More specifically, the repeat samples of Haaland are merely multiple acquisitions of calibration spectra obtained under differing perturbing conditions of the spectrometer.

Still further, repeat sample spectra are not sequential spectra because sequential refers to being arranged in a sequence or serial and repeat refers to perform a process again. However, Haaland fails to disclose, teach or suggest obtaining sequential spectra. Rather, Haaland teaches (4th sentence [0031]), "This repeat sample can then represent all the environmental changes occurring during the period of the calibration." Here, Haaland is teaching that a repeat sample spectrum is a spectrum obtained by "performing again" during the calibration the act of obtaining a calibration spectrum. Later, Haaland says (2nd to last line of [0031]) "... if multiple repeat spectra are obtained or if multiple repeat samples are used ... ," but, because multiple does not mean "arranged in a sequence", Haaland makes no mention of sequential spectra, or spectra obtained serially in time.

Because Haaland does not teach obtaining sequential spectra, or spectra serially in time, as do the inventors, Haaland's repeat sample spectra are not sequential spectra.

Still further, however, if Haaland's using the sequential spectra for repeat sample spectra as required by Appellant's claims, Haaland can not produce the spectral shapes Haaland seeks, because Haaland's repeat sample spectra are calibration spectra from known samples, whereas the sequential spectra required by the independent claims are from the unknown. That Haaland's repeat sample spectra are from known calibration samples is further emphasized in the last sentence of [0031] where Haaland says, "Repeat spectra taken as close as possible in time to the unknown sample spectrum should provide the best correction for drift of the system." If repeat spectra were spectra of the unknown, Haaland would not need to distinguish them from the unknown sample spectrum by saying "as close as possible in time to the unknown sample spectrum."

Thus, according to Haaland, repeat sample spectra of known calibration samples are used to derive spectral shapes to correct for "drift" as Haaland defines it. Using the sequential spectra of the unknown sample will not provide the spectral shapes of Haaland, because Haaland's spectral shapes are obtained by reference to effects of "drift" on known samples of the calibration spectra and not the effect on unknown samples.

Moreover, unlike the Appellant's sequential spectra that are later corrected for the effects of drift, Haaland's repeat sample spectra are not corrected for the effects of drift. Haaland's repeat sample spectra merely serve to quantify drift by giving its effect some spectral shape later used in correcting the unknowns for "drift" along the vertical axis of the spectrum, for example, caused by baseline offset, or gain variations due to the "drift" of sensitivity of spectrometer detectors.

Obremski fails to overcome the deficiencies of Haaland. As stated above, Obremski is merely cited for allegedly teaching a number of available spectral analysis software packages.

Ito fails to overcome the deficiencies of Haaland and Obremski. As stated above, Ito is merely cited as disclosing waveform factor analysis along the time axis.

Accordingly, Haaland, Obremski And Ito, alone or in combination, fail to disclose teach or suggest "transforming a plurality of sequential spectra obtained from a spectrometer."

b. Haaland, Obremski And Ito fail to disclose, teach, or suggest that the plurality of transformed sequential spectra "provide an array of row vectors compensated for effects of drift of data."

The Final Office Action is correct Haaland compensates for the effects of drift of data by adding spectral shapes to samples during prediction. However, adding spectral shapes to samples during prediction is not the same as providing an array of row vectors compensated for the effects of drift of data. Appellant's independent claims clearly require provide an array of row vectors compensated for effects of drift of data. For example, as described in the specification, at page 45, line 8, an array of row vectors compensated for effects of drift of data include a sequential array of moduli of Fourier transformed spectra and a sequential spectra corrected for the effects of drift before any application of principal factor analysis.

In contrast, the spectral shapes of Haaland obtained from repeat sample spectra are defined by Haaland as "any change in the sample spectrum," "if the sample is invariant with time" ([0031] 5th sentence). This means that Haaland's spectral shapes are the difference spectra between a calibration spectrum and a repeat spectrum of a calibration sample. These spectral shapes are not in any sense corrected for drift, but in fact serve to measure its effect on the calibration spectrum, and by inference on the unknown sample spectrum.

This is at odds with what the Appellant claims because the Appellant do not even attempt to measure the effects of drift through spectral shapes. Rather, the claims of Appellant remove the effects of drift completely from the sequential spectra by correcting the spectra for the effects of drift without the necessity of spectral shapes that are difference spectra, measuring the effects of drift. Moreover, since the nature of the drift is different in Haaland from that dealt with by the Appellant, the Appellant maintain that Haaland's technique will not work on Appellant's sequential spectra.

In addition, Haaland's technique in general requires calibration spectra, and repeat spectra to obtain spectral shapes for drift. However, because calibration spectra are not in general required by the Appellant's invention, spectral shapes as defined by Haaland as the difference spectra between a calibration spectrum and a repeat spectrum of a calibration sample are not required and therefore Appellant's invention provides a major advantage over

Haaland's technique. Therefore, what Haaland does and what Haaland is correcting for is not the same as what the Appellant do or correct for.

Haaland's teaching is simply not relevant to Appellant's technique as recited in the independent claims. By way of further explanation, Appellant deal with the lateral drift problem, i.e. drift that manifests itself as an offset along the abscissa, or independent variable axis of the spectrum, in an entirely different fashion from Haaland, because the nature of the drift Appellant are dealing with is different from Haaland's. Appellant does not synthesize new spectral shapes to deal with it because Appellant's technique does not require such spectral shapes in order to correct for the lateral drift. Moreover, Appellant does not add in spectral shapes to correct for drift. Rather, Appellant eliminates the effects of drift directly through a subsequent process, as discussed below, on the unknown spectra themselves without the necessity of synthesizing spectral shapes to account for the perturbing effects of drift.

Obremski fails to overcome the deficiencies of Haaland. As stated above, Obremski is merely cited for allegedly teaching a number of available spectral analysis software packages.

Ito fails to overcome the deficiencies of Haaland and Obremski. As stated above, Ito is merely cited as disclosing waveform factor analysis along the time axis.

Accordingly, Haaland, Obremski And Ito, alone or in combination, fail to disclose teach or suggest that the plurality of transformed sequential spectra "provide an array of row vectors compensated for effects of drift of data."

c. Haaland, Obremski And Ito fail to disclose, teach, or suggest an array of row vectors compensated for effects of drift of data "along an independent variable axis, wherein the array of row vectors compensated for effects of drift of data along the independent variable axis constitutes a drift-compensated array."

The Final Office Action states "Haaland clearly utilizes repeat sampling with known parameters as independent variables to define spectral shapes representative of the effects of those independent variables which are stored in a calibration data base and later utilized in a multivariate analysis of unknown spectra, that has been designed to compensate for drift."

However, the Final Office Action is wrong to identify "an independent variable axis" in the independent claims with independent variables used to identify spectral shapes in Haaland. The plain meaning of "an independent variable axis" is the abscissa of a two dimensional plot. The Appellant's use of "an independent variable axis" is as the abscissa of Appellant's sequential spectra.

Moreover, the teaching of Haaland and Obremski, alone or in combination, are not relevant to the technique recited in Appellant's independent claims. The Final Office Action apparently misapprehends what is meant by independent variable axis. Independent variable axis, refers to the abscissa of the unknown spectrum, as the abscissa is generally referred to in the art as the "independent variable axis," and is not a new independent variable to account for some extraneous influence on a linear least squares fitting model as in Haaland. Appellant is only concerned with the abscissa and shifts of spectra along it manifested as drift. The Final Office Action may regard each variable as having an independent variable axis associated with it, but these are not the abscissa as used in the claims, i.e., independent variable axis.

Moreover, there is no suggestion in Haaland that each variable has associated with itself its own independent variable axis. The interpretation presented in the Final Office Action is without support because Haaland does not use the term independent variable axis in '047. Therefore, the examiner's identification of each calibration shape with a separate independent variable axis is purely speculative and unsupported by Haaland.

Moreover, there is no suggestion in Haaland that the effects for each of these independent variables, as the examiner has identified them, can be corrected for by removing a shift along the abscissa from a spectrum of an unknown, nor is there any teaching on how to so remove a shift along the abscissa from a spectrum of an unknown as is disclosed in our invention. Rather, Haaland chooses to treat the effects of these independent variables by adding spectral shapes for their effects to a linear least squares model that requires measurements on extra repeat samples, unlike our technique.

Obremski fails to overcome the deficiencies of Haaland. As stated above, Obremski is merely cited for allegedly teaching a number of available spectral analysis software packages.

Ito fails to overcome the deficiencies of Haaland and Obremski. As stated above, Ito is merely cited as disclosing waveform factor analysis along the time axis.

Accordingly, Haaland, Obremski And Ito, alone or in combination, fail to disclose teach or suggest an array of row vectors compensated for effects of drift of data "along an independent variable axis, wherein the array of row vectors compensated for effects of drift of data along the independent variable axis constitutes a drift-compensated array."

d. Haaland, Obremski And Ito fail to disclose, teach, or suggest "performing a principal-factor determination on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis."

The Final Office Action states that the classical least squares (CLS) calibration method is a principal factor determination. However, the Final Office Action is wrong to believe that in general a principal factor determination is CLS. A principal factor determination is a matrix eigenvalue determination technique, whereas CLS is based on the minimization of the residual differences between an unknown spectrum and standard spectra. Because a matrix eigenvalue determination is completely different from CLS and based on entirely different mathematical models, Haaland fails to suggest performing a principal-factor determination on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis.

The Final Office Action is correct that through adding spectral shapes in the CLS model, the effects of "drift" are compensated for in Haaland. However, the "drift" that Haaland compensates for is not used in "a principal-factor determination on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data" as required by the independent claims of Appellant, because the "drift" effects that Haaland compensates for are not the same as the "drift" effects that the inventors compensate for.

Nevertheless, assuming arguendo that the "drift" effects Haaland compensates for were the same as those compensated for by the inventors, what Haaland does is not the same as what the inventors do because the drift effects are already removed from the drift-compensated array before the principal factor determination is applied to it, whereas in

Haaland the "drift" effects are still present in his unknown sample spectra before he applies CLS to remove it.

Accordingly, the starting point for the two techniques is different because Appellant starts with data from which drift effects have already been compensated for, whereas in Haaland it is still present before CLS is applied. Thus, there is no reason for the Appellant to apply CLS to the drift-compensated array to remove "drift" because it has already been removed in the "dephasing" procedure.

The Examiner is correct that "[0031] … it is best to perform an eigenvector analysis . . . on the repeat sample spectra and to add only those eigenvector shapes that are detrimental to the CLS calibration." But, what Haaland does here is not the same as what the Appellant does. Because the Appellant uses eigenvector analysis or CLS on the drift-compensated array in "performing a principal-factor determination … to provide a set of principal factors …" , after the effects of drift have already been removed from the sequential spectra, the Appellant does not use eigenvector analysis to add only those eigenvector shapes that are detrimental to the CLS calibration as in Haaland.

The Final Office Action is correct that "[0004] Classical least squares (CLS) quantitative multivariate calibration methods are based on an explicit or hard physical model (e.g., Beer's law), . . ." But, what Haaland does is not the same as what the Appellant does because the Appellant does not use CLS to remove the effects of "drift", as discussed above.

Moreover, the classical least squares (CLS) technique works well for effects that manifest themselves as shifts in the vertical direction of a spectrum, but not for shifts along the independent axis. The unknown is then viewed as a composite of the superposition of these spectra that are unshifted along the independent axis, weighed by various fitting factors. It requires therefore a set of calibration spectra for each of the constituents in the unknown, as well as "spectral shapes" for extraneous effects.

Appellants' technique, as recited in the independent claims, does not require such repeat spectra embodying the effect of drift as a spectral shape to be added along with other spectra to model the unknown. In fact, Haaland himself recognizes that the technique of CLS is not generally applicable to all spectral analysis problems when he says in [0004] 4th sentence: "… the method is readily understood, simple to apply, and when the model is valid, CLS requires fewer calibration samples …"

Appellants recognize that CLS is an invalid model for dealing with the effects of drift along the abscissa. The Final Office Action appears to operate under the misapprehension that CLS can deal with all modeling problems associated with the determination of constituents in the spectrum of an unknown. However, CLS breaks down when the spectra of multiple unknowns are shifting in an unpredictable fashion up and down the abscissa, i.e. independent variable axis. Appellant's invention, as recited in the independent claims, removes these unpredictable shifts through a "dephasing procedure" and then applies linear modeling like PCA (principal component analysis) to determine the contributions of various principle components to the unknown spectra. Appellant's invention, as recited in the independent claims, does not use linear modeling like PCA on these raw unknown spectra directly as suggested by the Haaland technique because the results would be worthless. Rather, Appellant's invention, as recited in the independent claims, remove the effects of the shifts along the abscissa using a "dephasing procedure" before applying any linear modeling, i.e. principal factor determination.

Obremski fails to overcome the deficiencies of Haaland. As stated above, Obremski is merely cited for allegedly teaching a number of available spectral analysis software packages.

Ito fails to overcome the deficiencies of Haaland and Obremski. As stated above, Ito is merely cited as disclosing waveform factor analysis along the time axis.

Accordingly, Haaland, Obremski And Ito, alone or in combination, fail to disclose teach or suggest performing a principal-factor determination on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis.

e. Haaland, Obremski And Ito fail to disclose, teach, or suggest "generating, from a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis, scaled target-factor profiles compensated for effects of drift of data along the independent variable axis."

As described above, Haaland and Obremski, alone or in combination, fail to disclose, teach or suggest row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis. Accordingly, Haaland and Obremski, alone or in combination, cannot disclose, teach or suggest generating anything from such items.

The Final Office Action asserts that the generated profile trajectory is equivalent to a prediction curve from matrixed spectral shape data, which the Examiner believes is described in paragraph 0066. Paragraph 0066 describes FIG. 14, which outlines the various steps of the hybrid prediction method using the example of predicting urea concentrations in variable temperature aqueous solutions where the spectral shapes added during prediction represent spectral shapes of spectrometer drift obtained from a subset of samples measured during both calibration and prediction experiments. With respect to this element of claim 70, the Office Action also cites Fig. 12 of Haaland.

While the Final Office Action correctly indicates that Fig. 14 outlines the various steps of the hybrid prediction method of Haaland, the hybrid prediction method of Haaland is not the same as generating, from a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis, scaled target-factor profiles compensated for effects of drift of data along the independent variable axis. The hybrid prediction method of Haaland uses CLS to remove the effects of "drift. However, Appellant does not use CLS to remove the effects of drift, but rather uses CLS in one embodiment and then only to find principal factors, and not to compensate for the effects of drift. More particularly, the Final Office Action is wrong to indicate that the generated profile trajectory is equivalent to a prediction curve from matrixed spectral shape data, which the Final Office Action believes is described in paragraph [0066].

The profile trajectory is not a plot of the effects of a single analyte on the unknown as shown in Fig. 12 of Haaland. Fig. 12 of Haaland is what is called in the art a calibration curve of a single analyte. The profile trajectory incorporates the effects of all analytes on the behavior of all "the row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis." Because the target trajectory manifests the effects of all the analytes, it is not a calibration curve of a single analyte, and therefore not equivalent to a prediction curve such as Fig. 12 of Haaland.

In addition, referring to paragraph [0056], last two sentences, of Haaland, and to Fig. 6 discussed therein, Haaland discusses the spectral shapes used to compensate for the drift discusses in Fig. 14. Clearly in Fig. 6, none of the spectra are shifted laterally along the abscissa, i.e. wavenumber axis in this case; rather, all the calibration and repeat sample spectra shown in this figure have their peaks and valleys at nominally the same position. Therefore, the effects of drift that Haaland is compensating for in this figure manifest themselves as a scaling or offsetting of the intensity in the vertical direction or as having other spectral shapes added to the intensity, but not as an offset along the abscissa, wavenumber axis.

Appellant maintains that Haaland's method will break down if it is applied to the offsets along the abscissa. Moreover, the drift as described by Haaland applies to vertical scaling of intensity in the direction of the ordinate, and not to shifts along the abscissa, i.e. independent variable axis. Whether or not the generated profile trajectory is equivalent to a prediction curve of Haaland is irrelevant.

Moreover, the generated profile trajectory is not equivalent to Haaland's prediction curve because each point of the profile trajectory represents a different unknown in terms of the contributions from all of the constituents in the unknown, whereas Haaland's prediction curve represents the variation of the amount of a single constituent in the unknown.

Obremski fails to overcome the deficiencies of Haaland. As stated above, Obremski is merely cited for allegedly teaching a number of available spectral analysis software packages.

Ito fails to overcome the deficiencies of Haaland and Obremski. As stated above, Ito is merely cited as disclosing waveform factor analysis along the time axis.

Accordingly, Haaland, Obremski And Ito, alone or in combination, fail to disclose teach or suggest generating, from a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis, scaled target-factor profiles compensated for effects of drift of data along the independent variable axis.

2. Haaland, Obremski And Ito Fail To Disclose, Teach Or Suggest the Limitations of Dependent Claims 76-79, 93-96, 115-118 and 133-136.

a. Haaland, Obremski And Ito fail to disclose, teach, or suggest "inputting a plurality of sequential spectra from a spectrometer into a computer system, ordering the spectra in a primal array of row vectors, wherein each sequential spectrum constitutes a successive row vector of the primal array and removing phase factors due to drift using a dephasing procedure that transforms the primal array into a drift-compensated array."

The Final Office Action merely refers to Obremski as disclosing, in general, spectral analysis procedures. However, Haaland, Obremski And Ito all fail to mention or even suggest the particular steps of inputting a plurality of sequential spectra from a spectrometer into a computer system, ordering the spectra in a primal array of row vectors, wherein each sequential spectrum constitutes a successive row vector of the primal array and removing phase factors due to drift using a dephasing procedure that transforms the primal array into a drift-compensated array.

Accordingly, Claims 76-79, 93-96, 115-118 and 133-136 are patentable over Haaland, Obremski And Ito, alone or in combination.

3. **Haaland, Obremski And Ito Fail To Disclose, Teach Or Suggest the Limitations of Dependent Claims 81, 98, 120 and 138.**

a. **Haaland, Obremski And Ito fail to disclose, teach, or suggest "forming a covariance array from the drift-compensated array, applying an eigenanalysis to the covariance array to define a complete set of eigenvectors and eigenvalues and defining a set of drift-compensated principal factors by selecting a subset of eigenvectors from the complete set of eigenvectors."**

The Final Office Action merely refers to Obremski as disclosing, in general, spectral analysis procedures. However, Haaland, Obremski And Ito all fail to mention or even suggest the particular steps of forming a covariance array from the drift-compensated array, applying an eigenanalysis to the covariance array to define a complete set of eigenvectors and eigenvalues and defining a set of drift-compensated principal factors by selecting a subset of eigenvectors from the complete set of eigenvectors. While Haaland mentions eigenvector analysis and the use of a covariance matrix by Wentzell, Haaland, Obremski And Ito all fail to suggest the particular steps recited in claims 81, 98, 120 and 138.

Accordingly, Claims 81, 98, 120 and 138 are patentable over Haaland, Obremski And Ito, alone or in combination.

4. **Haaland, Obremski And Ito Fail To Disclose, Teach Or Suggest the Limitations of Dependent Claims 82, 99, 121 and 139.**

a. **Haaland, Obremski And Ito fail to disclose, teach, or suggest "the defining the set of drift-compensated principal factors further comprises selecting the drift-compensated principal factors as a first few eigenvectors corresponding to eigenvalues above a certain limiting value."**

The Final Office Action merely refers to Obremski as disclosing, in general, spectral analysis procedures. However, Haaland, Obremski And Ito all fail to mention or even suggest that the defining the set of drift-compensated principal factors further comprises selecting the drift-compensated principal factors as a first few eigenvectors corresponding to eigenvalues above a certain limiting value. Haaland, Obremski And Ito all fail to suggest using a predetermined value as a filter for selecting the drift-compensated principal factors.

Accordingly, Claims 82, 99, 121 and 139 are patentable over Haaland, Obremski And Ito, alone or in combination.

5. **Haaland, Obremski And Ito fail to disclose, teach, or suggest the limitations of dependent claims 71-75, 80, 83-88, 90-92, 97, 100-104, 106-109, 111-114, 119, 122-127, 130-132, 137 and 140-144.**

Because dependent claims 71-75, 80, 83-88, 90-92, 97, 100-104, 106-109, 111-114, 119, 122-127, 130-132, 137 and 140-144 from Appellant's Application are dependent from the patentable claims discussed above, and because dependent claims 71-75, 80, 83-88, 90-92, 97, 100-104, 106-109, 111-114, 119, 122-127, 130-132, 137 and 140-144 include further limitations, Appellant submit that the claims are patentable over Haaland, Obremski And Ito.

VIII. Conclusion

In view of the above, Appellants submit that the rejections are improper, the claimed invention is patentable, and that the rejections of claims 70-109, 111-127 and 129-147 should be reversed. Appellants respectfully request reversal of the rejections as applied to the appealed claims and allowance of the entire application.

Authority to charge the assignee's deposit account was provided on the first page of this brief.

Respectfully submitted,

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APPENDIX OF APPEALED CLAIMS FOR APPLICATION NO. 09/650,821

1-69. (Cancelled)

70. (Previously Presented) A spectral processing method for compensating a plurality of sequential spectra and profiles derived therefrom for effects of drift of data along an independent variable axis, comprising:

transforming a plurality of sequential spectra obtained from a spectrometer to provide an array of row vectors compensated for effects of drift of data along an independent variable axis, wherein the array of row vectors compensated for effects of drift of data along the independent variable axis constitutes a drift-compensated array;

performing a principal-factor determination on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis; and

generating, from a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis, scaled target-factor profiles compensated for effects of drift of data along the independent variable axis.

71. (Previously Presented) The spectral processing method of claim 70, wherein the independent variable axis comprises an abscissa of the electron spectrum.

72. (Previously Presented) The spectral processing method of claim 71, wherein the drift comprises drift of data along the independent variable axis in a positive or negative direction.

73. (Previously Presented) The spectral processing method of claim 70, wherein the independent variable axis comprises a axis representing temporal displacement of the data.

74. (Previously Presented) The spectral processing method of claim 70 further comprising outputting the transformed array of row vectors compensated for drift of data along the independent variable axis as a sequential series of moduli wherein phase factors due to drift are nullified.

75. (Previously Presented) The spectral processing method of claim 70 further comprising generating drift-compensated compositional profiles from the drift-compensated scaled target-factor profiles.

76. (Previously Presented) The spectral processing method of claim 70, wherein the transforming the plurality of sequential spectra further comprises:

inputting a plurality of sequential spectra from a spectrometer into a computer system;

ordering the spectra in a primal array of row vectors, wherein each sequential spectrum constitutes a successive row vector of the primal array; and

removing phase factors due to drift using a dephasing procedure that transforms the primal array into a drift-compensated array.

77. (Previously Presented) The spectral processing method of claim 76, wherein the dephasing procedure for transforming the primal array into the drift-compensated array further comprises applying a Fourier transform to the spectra in the primal array of row vectors forming an array of Fourier-transformed row vectors, multiplying each Fourier-transformed row vector by a complex conjugate of each Fourier-transformed row vector to form a squared moduli vector thereby removing phase factors due to drift, taking the square root of each element of the squared moduli vector to create a corresponding moduli vector, and forming a drift-compensated array of moduli vectors by successively sequencing the moduli vectors as successive drift-compensated row vectors in a drift-compensated array, wherein the moduli vectors constitute moduli of Fourier-transformed spectra.

78. (Previously Presented) The spectral processing method of claim 76,

wherein the dephasing procedure for transforming the primal array into the drift-compensated array further comprises applying a fitting procedure to each spectrum in the primal array using selected reference spectra, calculating through the fitting procedure a corresponding reference weighting factor for each reference spectrum corresponding to each spectrum in the primal array, removing the phase factor due to drift from each spectrum in the primal array by synthesizing a corresponding drift-compensated spectrum given by the sum of each selected reference spectrum multiplied by the corresponding reference weighting factor, and forming a drift-compensated array by successively sequencing the drift-compensated spectra as successive drift-compensated row vectors in the drift-compensated array.

79. (Previously Presented) The spectral processing method of claim 78 further comprising outputting analytical results selected from the group consisting of the selected reference spectra used in the fitting procedure, the drift-compensated row vectors of the drift-compensated array as a sequential series of drift-compensated spectra, reference weighting factors for each reference spectrum corresponding to each spectrum in the primal array as a set of drift-compensated reference-spectrum profiles, and phase factors due to drift for each reference spectrum corresponding to each spectrum in the primal array as a set of phase-factor profiles.

80. (Previously Presented) The spectral processing method of claim 70, wherein the performing the principal-factor determination comprises performing a factor analysis.

81. (Previously Presented) The spectral processing method of claim 80, wherein the performing the factor analysis further comprises:

forming a covariance array from the drift-compensated array;

applying an eigenanalysis to the covariance array to define a complete set of eigenvectors and eigenvalues; and

defining a set of drift-compensated principal factors by selecting a subset of eigenvectors from the complete set of eigenvectors.

82. (Previously Presented) The spectral processing method of claim 81, wherein the defining the set of drift-compensated principal factors further comprises selecting the drift-compensated principal factors as a first few eigenvectors corresponding to eigenvalues above a certain limiting value.

83. (Previously Presented) The spectral processing method of claim 70, wherein the performing the principal-factor determination comprises performing a linear-least-squares analysis.

84. (Previously Presented) The spectral processing method of claim 83, wherein the performing a linear-least-squares analysis further comprises:

selecting a set of initial factors from the set of drift-compensated row vectors of the drift-compensated array;

performing a linear-least-squares decomposition with the set of initial factors on the drift-compensated row vectors in the drift-compensated array to provide a set of residue factors; and

performing a Gram-Schmidt orthonormalization on the combined set of initial factors and residue factors to provide drift-compensated principal factors.

85. (Previously Presented) The spectral processing method of claim 70, wherein the generating drift-compensated scaled target-factor profiles further comprises:

constructing a set of drift-compensated target factors on a space of the drift-compensated principal factors;

applying the set of drift-compensated target factors to a profile trajectory lying within a space of drift-compensated principal factors to obtain a sequential set of target-factor weighting factors corresponding to the drift-compensated target factors for the profile trajectory; and

outputting analytical results selected from the group consisting of a set of drift-compensated scaled target-factor profiles derived from the set of target-factor weighting factors, and the set of drift-compensated target factors.

86. (Previously Presented) The spectral processing method of claim 85, wherein the constructing the set of drift-compensated target factors further comprises:

generating a profile trajectory on a 3-dimensional projection of a 4-dimensional space of a set of first-four, drift-compensated principal factors along with a reference tetrahedron the vertices of which represent each of the first-four, drift-compensated principal factors;

enclosing the profile trajectory within an enclosing tetrahedron with vertices centered on end-points and in proximity to turning points of the profile trajectory, and with faces lying essentially tangent to portions of the profile trajectory; and

calculating the drift-compensated target factors from the normed coordinates of the vertices of the enclosing tetrahedron in terms of the drift-compensated principal factors.

87. (Previously Presented) The spectral processing method of claim 86, wherein the generating the profile trajectory further comprises:

calculating 4-space coordinates of a profile trajectory of drift-compensated target-factor profiles on a 4-dimensional space to produce four coordinates for each point in the profile trajectory, one coordinate for each of the first-four, drift-compensated principal factors;

reducing the dimensionality of the coordinates of the profile trajectory by dividing each coordinate by a sum of all four 4-space coordinates to produce normed coordinates for the profile trajectory; and,

plotting the normed coordinates for the profile trajectory in a 3-dimensional space the coordinate axes of which are edges of a reference tetrahedron, the vertices of which correspond to unit values for each of the first-four, drift-compensated principal factors in a manner analogous to plotting of coordinates on a quaternary phase diagram.

88. (Previously Presented) The spectral processing method of claim 85, wherein generating drift-compensated compositional profiles comprises:

defining a set of drift-compensated scaled target-factor profile values as the set of scaled target-factor weighting factors;

dividing each drift-compensated scaled target-factor profile value by a profile sensitivity factor for each constituent corresponding to the target factor to provide a sensitivity-scaled target-factor profile value;

normalizing the sensitivity-scaled target-factor profile value by dividing each sensitivity-scaled target-factor profile value for a given cycle number by the sum of all the sensitivity-scaled target-factor profile values for the given cycle number to provide drift-compensated compositional profile values at the given cycle number; and

outputting the drift-compensated compositional profile values as a set of drift-compensated compositional profiles.

89. (Previously Presented) A waveform processing method for compensating a plurality of sequential waveforms and profiles derived therefrom for effects of drift comprising:

transforming a plurality of sequential waveforms obtained from a waveform-source device to provide an array of row vectors compensated for effects of drift of data along an independent variable axis, wherein the array of row vectors compensated for effects of drift of data along an independent variable axis constitutes a drift-compensated array;

performing a principal-factor determination on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along an independent variable axis; and

generating, from a profile trajectory of the row vectors lying compensated for effects of drift of data along the independent variable axis within a space of principal factors compensated for effects of drift of data along the independent variable axis, scaled target-factor profiles compensated for effects of drift of data along the independent variable axis.

90. (Previously Presented) The waveform processing method of claim 89, wherein the independent variable axis comprises a time-axis of a waveform.

91. (Previously Presented) The waveform processing method of claim 90, wherein the drift comprises a phase lag or lead of data representing a waveform.

92. (Previously Presented) The waveform processing method of claim 89 further comprising outputting the drift-compensated row vectors of the drift-compensated array as a sequential series of moduli of Fourier-transformed waveforms.

93. (Previously Presented) The waveform processing method of claim 89, wherein the transforming the plurality of sequential waveforms further comprises:

inputting a plurality of sequential waveforms from a waveform-source device into a computer system;

ordering the waveforms in a primal array of row vectors, wherein each sequential waveform constitutes a successive row vector of the primal array; and

removing phase factors due to drift using a dephasing procedure that transforms the primal array into a drift-compensated array.

94. (Previously Presented) The waveform processing method of claim 93 wherein the dephasing procedure for transforming the primal array into the drift-compensated array further comprises applying a Fourier transform to the waveforms in the primal array of row vectors forming an array of Fourier-transformed row vectors, multiplying each Fourier-transformed row vector by a complex conjugate of each Fourier-transformed row vector to form a squared moduli vector thereby removing phase factors due to drift, taking the square root of each element of the squared moduli vector to create a corresponding moduli vector, and forming a drift-compensated array of moduli vectors by successively sequencing the moduli vectors as successive drift-compensated row vectors in a drift-compensated array, wherein the moduli vectors constitute moduli of Fourier-transformed waveforms.

95. (Previously Presented) The waveform processing method of claim 93, wherein the dephasing procedure for transforming the primal array into the drift-compensated array further comprises applying a fitting procedure to each sequential waveform in the primal array using selected reference waveforms, calculating through the fitting procedure a corresponding reference weighting factor for each reference waveform corresponding to each waveform in the primal array, removing the phase factor due to drift from each waveform in the primal array by synthesizing a corresponding drift-compensated waveform given by the sum of each selected reference waveform multiplied by the corresponding reference weighting factor, and forming a drift-compensated array by successively sequencing the drift-compensated waveforms as successive drift-compensated row vectors in the drift-compensated array.

96. (Previously Presented) The waveform processing method of claim 95 further comprising outputting analytical results selected from the group consisting of the selected reference waveforms used in the fitting procedure, the drift-compensated row vectors of the drift-compensated array as a sequential series of drift-compensated waveforms, reference weighting factors for each reference waveform corresponding to each waveform in the primal array as a set of drift-compensated reference-waveform profiles, and phase factors due to drift for each reference waveform corresponding to each waveform in the primal array as a set of phase-factor profiles.

97. (Previously Presented) The waveform processing method of claim 89, wherein the performing the principal-factor determination comprises performing a factor analysis.

98. (Previously Presented) The waveform processing method of claim 97, wherein the performing the factor analysis further comprises:

forming a covariance array from the drift-compensated array;

applying an eigenanalysis to the covariance array to define a complete set of eigenvectors and eigenvalues; and

defining a set of drift-compensated principal factors by selecting a subset of eigenvectors from the complete set of eigenvectors.

99. (Previously Presented) The waveform processing method of claim 98, wherein the defining the set of drift-compensated principal factors further comprises selecting the drift-compensated principal factors as a first few eigenvectors corresponding to eigenvalues above a certain limiting value.

100. (Previously Presented) The waveform processing method of claim 89, wherein the performing the principal-factor determination comprises performing a linear-least-squares analysis.

101. (Previously Presented) The waveform processing method of claim 100, wherein the performing a linear-least-squares analysis further comprises:

selecting a set of initial factors from the set of drift-compensated row vectors of the drift-compensated array;

performing a linear-least-squares decomposition with the set of initial factors on the drift-compensated row vectors in the drift-compensated array to provide a set of residue factors; and

performing a Gram-Schmidt orthonormalization on the combined set of initial factors and residue factors to provide drift-compensated principal factors.

102. (Previously Presented) The waveform processing method of claim 89, wherein the generating drift-compensated scaled target-factor profiles further comprises:

constructing a set of drift-compensated target factors on a space of the drift-compensated principal factors;

applying the set of drift-compensated target factors to a profile trajectory lying within a space of drift-compensated principal factors to obtain a sequential set of target-factor weighting factors corresponding to the drift-compensated target factors for the profile trajectory; and

outputting analytical results selected from the group consisting of a set of drift-compensated scaled target-factor profiles derived from the set of target-factor weighting factors, and the set of drift-compensated target factors.

103. (Previously Presented) The waveform processing method of claim 102, wherein the constructing the set of drift-compensated target factors further comprises:

generating a profile trajectory on a 3-dimensional projection of a 4-dimensional space of a set of first-four, drift-compensated principal factors along with a reference tetrahedron the vertices of which represent each of the first-four, drift-compensated principal factors;

enclosing the profile trajectory within an enclosing tetrahedron with vertices centered on end-points and in proximity to turning points of the profile trajectory, and with faces lying essentially tangent to portions of the profile trajectory; and

calculating the drift-compensated target factors from the normed coordinates of the vertices of the enclosing tetrahedron in terms of the drift-compensated principal factors.

104. (Previously Presented) The waveform processing method of claim 103, wherein the generating the profile trajectory further comprises:

calculating 4-space coordinates of a profile trajectory of drift-compensated target-factor profiles on a 4-dimensional space to produce four coordinates for each point in the profile trajectory, one coordinate for each of the first-four, drift-compensated principal factors;

reducing the dimensionality of the coordinates of the profile trajectory by dividing each coordinate by a sum of all four 4-space coordinates to produce normed coordinates for the profile trajectory; and,

plotting the normed coordinates for the profile trajectory in a 3-dimensional space the coordinate axes of which are edges of a reference tetrahedron, the vertices of which correspond to unit values for each of the first-four, drift-compensated principal factors in a manner analogous to plotting of coordinates on a quaternary phase diagram.

105. (Previously Presented) An apparatus for compensating a plurality of sequential spectra and profiles derived therefrom for effects of drift comprising a spectroscopic analysis system, wherein the spectroscopic analysis system comprises:

a spectrometer; and

a computer system, coupled to the spectrometer, for analyzing spectra input from the spectrometer, the computer system further comprising a spectral processor for compensating a plurality of sequential spectra and profiles derived therefrom for effects of drift of data along an independent variable axis;

wherein the spectral processor further comprises:

a spectral transformer operating on a plurality of sequential spectra obtained from the spectrometer to provide an array of row vectors compensated for effects of drift of data along the independent variable axis, wherein the array of row vectors compensated for effects of drift of data along an independent variable axis constitutes a drift-compensated array;

a principal-factor determinator operating on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis; and

a profile generator operating on a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis to provide a set of scaled target-factor profiles compensated for effects of drift of data along the independent variable axis.

106. (Previously Presented) The apparatus of claim 105, wherein the spectrometer comprises an electron spectrometer.

107. (Previously Presented) The apparatus of claim 106, wherein the electron spectrometer comprises an Auger spectrometer.

108. (Previously Presented) The apparatus of claim 106, wherein the electron spectrometer comprises an x-ray photoelectron spectrometer.

109. (Previously Presented) The apparatus of claim 106, wherein the electron spectrometer comprises an electron energy loss spectrometer.

110. (Canceled)

111. (Previously Presented) The apparatus of claim 105, wherein the independent variable axis comprises an abscissa of the electron spectrum.

112. (Previously Presented) The apparatus of claim 111, wherein the drift comprises drift of data along the independent variable axis in a positive or negative direction.

113. (Previously Presented) The apparatus of claim 105, wherein the spectral transformer outputs to an output device the drift-compensated row vectors of the drift-compensated array as a sequential series of moduli of Fourier-transformed spectra.

114. (Previously Presented) The apparatus of claim 105, wherein the profile generator operating on the set drift-compensated scaled target-factor profiles generates a set of drift-compensated compositional profiles.

115. (Previously Presented) The apparatus of claim 105, wherein the spectral transformer accepts as input the plurality of sequential spectra obtained from the spectrometer into the computer system, orders the spectra in a primal array, wherein each sequential spectrum constitutes a successive row vector of the primal array, and removes phase factors due to drift using a dephasor that transforms the primal array into a drift-compensated array.

116. (Previously Presented) The apparatus of claim 115, wherein the dephasor that transforms the primal array into the drift-compensated array applies a Fourier transform to the spectra in the primal array of row vectors to form an array of Fourier-transformed row vectors, multiplies each Fourier-transformed row vector by a complex conjugate of each Fourier-transformed row vector to form a squared moduli vector thereby removing phase factors due to drift, takes the square root of each element of the squared moduli vector to create a corresponding moduli vector, and forms a drift-compensated array of moduli vectors by successively sequencing the moduli vectors as successive drift-compensated row vectors in a drift-compensated array, wherein the moduli vectors constitute moduli of Fourier-transformed spectra.

117. (Previously Presented) The apparatus of claim 116, wherein the dephasor that transforms the primal array into the drift-compensated array fits each spectrum in the primal array using selected reference spectra, calculates a corresponding reference weighting factor for each reference spectrum corresponding to each spectrum in the primal array, synthesizes a corresponding drift-compensated spectrum given by the sum of each selected reference spectrum multiplied by the corresponding reference weighting factor thereby removing phase factors due to drift, and forms a drift-compensated array by successively sequencing the drift-compensated spectra as successive drift-compensated row vectors in the drift-compensated array.

118. (Previously Presented) The apparatus of claim 117, wherein the spectral transformer outputs to an output device analytical results selected from the group consisting of the selected reference spectra used in the fitting procedure, the drift-compensated row vectors of the drift-compensated array as a sequential series of drift-compensated spectra, reference weighting factors for each reference spectrum corresponding to each spectrum in the primal array as a set of drift-compensated reference-spectrum profiles, and phase factors due to drift for each reference spectrum corresponding to each spectrum in the primal array as a set of phase-factor profiles.

119. (Previously Presented) The apparatus of claim 105, wherein the principal-factor determinator comprises a factor analyzer.

120. (Previously Presented) The apparatus of claim 119, wherein the factor analyzer forms a covariance array from the drift-compensated array, applies an eigenanalysis to the covariance array to define a complete set of eigenvectors and eigenvalues, and defines a set of drift-compensated principal factors as a subset of eigenvectors determined by a selector operating on the complete set of eigenvectors.

121. (Previously Presented) The apparatus of claim 120, wherein the selector operates on the complete set of eigenvectors to define the set of drift-compensated principal factors as a first few eigenvectors corresponding to eigenvalues above a certain limiting value.

122. (Previously Presented) The apparatus of claim 105, wherein the principal-factor determinator comprises a linear-least-squares analyzer.

123. (Previously Presented) The apparatus of claim 122, wherein the linear-least-squares analyzer selects a set of initial factors from the set of drift-compensated row vectors of the drift-compensated array, performs a linear-least-squares decomposition with the set of initial factors on the drift-compensated row vectors in the drift-compensated array to provide a set of residue factors, and performs a Gram-Schmidt orthonormalization on the combined set of initial factors and residue factors to provide drift-compensated principal factors.

124. (Previously Presented) The apparatus of claim 105, wherein the profile generator defines a set of drift-compensated target factors on a space of the drift-compensated principal factors determined by a target-factor constructor operating on the drift-compensated principal factors, applies the set of drift-compensated target factors to a profile trajectory lying within a space of drift-compensated principal factors to obtain a sequential set of target-factor weighting factors corresponding to the drift-compensated target factors for the profile trajectory, and outputs to an output device analytical results selected from the group consisting of a set of drift-compensated scaled target-factor profiles derived from the set of target-factor weighting factors, and the set of drift-compensated target factors.

125. (Previously Presented) The apparatus of claim 124, wherein the target-factor constructor generates a profile trajectory on a 3-dimensional projection of a 4-dimensional space of a set of first-four, drift-compensated principal factors along with a reference tetrahedron the vertices of which represent each of the first-four, drift-compensated principal factors; encloses the profile trajectory within an enclosing tetrahedron with vertices centered on end-points and in proximity to turning points of the profile trajectory, and with faces lying essentially tangent to portions of the profile trajectory; and calculates the drift-compensated target factors from the normed coordinates of the vertices of the enclosing tetrahedron in terms of the drift-compensated principal factors.

126. (Previously Presented) The apparatus of claim 125, wherein the target-factor constructor in generating the profile trajectory further calculates 4-space coordinates of a profile trajectory of drift-compensated target-factor profiles on a 4-dimensional space to produce four coordinates for each point in the profile trajectory, one coordinate for each of the first-four, drift-compensated principal factors; reduces the dimensionality of the coordinates of the profile trajectory by dividing each coordinate by a sum of all four 4-space coordinates to produce normed coordinates for the profile trajectory; and, plots the normed coordinates for the profile trajectory in a 3-dimensional space the coordinate axes of which are edges of a reference tetrahedron the vertices of which correspond to unit values for each of the first-four, drift-compensated principal factors in a manner analogous to plotting of coordinates on a quaternary phase diagram.

127. (Previously Presented) The apparatus of claim 124, wherein the profile generator further defines a set of drift-compensated scaled target-factor profile values as the set of scaled target-factor weighting factors, divides each drift-compensated scaled target-factor profile value by a profile sensitivity factor for each constituent corresponding to the target factor to provide a sensitivity-scaled target-factor profile value, divides each sensitivity-scaled target-factor profile value for a given cycle number by the sum of all the sensitivity-scaled target-factor profile values for the given cycle number to provide drift-compensated compositional profile values at the given cycle number, and outputs the drift-compensated compositional profile values as a set of drift-compensated compositional profiles.

128. (Canceled)

129. (Previously Presented) An apparatus for compensating a plurality of sequential waveforms and profiles derived therefrom for effects of drift, comprising a waveform analysis system, wherein the waveform analysis system comprises:

a waveform-source device; and

a computer system, coupled to the waveform-source device, for analyzing waveforms input from the waveform-source device, the computer system further comprising a waveform processor for compensating a plurality of sequential waveforms and profiles derived therefrom for effects of drift of data along an independent variable axis;

wherein the waveform processor further comprises:

a waveform transformer operating on a plurality of sequential waveforms obtained from a waveform-source device to provide an array of row vectors compensated for effects of drift of data along the independent variable axis, wherein the array of row vectors compensated for effects of drift of data along the independent variable axis constitutes a drift-compensated array;

a principal-factor determinator operating on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis; and

a profile generator operating on a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis to provide a set of scaled target-factor profiles compensated for effects of drift of data along the independent variable axis.

130. (Previously Presented) The apparatus of claim 129, wherein the independent variable axis comprises a time-axis of a waveform.

131. (Previously Presented) The apparatus of claim 130, wherein the drift comprises a phase lag or lead of data representing a waveform.

132. (Previously Presented) The apparatus of claim 129, wherein the waveform transformer outputs the drift-compensated row vectors of the drift-compensated array as a sequential series of moduli of Fourier-transformed waveforms.

133. (Previously Presented) The apparatus of claim 129, wherein the waveform transformer accepts as input the plurality of sequential waveforms obtained from a waveform-source device into the computer system, orders the waveforms in a primal array, wherein each sequential waveform constitutes a successive row vector of the primal array, and removes phase factors due to drift using a dephasor that transforms the primal array into a drift-compensated array.

134. (Previously Presented) The apparatus of claim 133, wherein the dephasor that transforms the primal array into the drift-compensated array applies a Fourier transform to the primal array of row vectors to form an array of Fourier-transformed row vectors, multiplies each Fourier-transformed row vector by a complex conjugate of each Fourier-transformed row vector to form a squared moduli vector thereby removing phase factors due to drift, takes the square root of each element of the squared moduli vector to create a corresponding moduli vector, and forms a drift-compensated array of moduli vectors by successively sequencing the moduli vectors as successive drift-compensated row vectors in a drift-compensated array, wherein the moduli vectors constitute moduli of Fourier-transformed waveforms.

135. (Previously Presented) The apparatus of claim 133, wherein the dephasor that transforms the primal array into the drift-compensated array fits each waveform in the primal array using selected reference waveforms, calculates a corresponding reference weighting factor for each reference waveform corresponding to each waveform in the primal array, synthesizes a corresponding drift-compensated waveform given by the sum of each selected reference waveform multiplied by the corresponding reference weighting factor thereby removing phase factors due to drift, and forms a drift-compensated array by successively sequencing the drift-compensated waveforms as successive drift-compensated row vectors in the drift-compensated array.

136. (Previously Presented) The apparatus of claim 135, wherein the waveform transformer outputs to an output device analytical results selected from the group consisting of the selected reference waveforms used in the fitting procedure, the drift-compensated row vectors of the drift-compensated array as a sequential series of drift-compensated waveforms, reference weighting factors for each reference waveform corresponding to each waveform in the primal array as a set of drift-compensated reference-waveform profiles, and phase factors due to drift for each reference waveform corresponding to each waveform in the primal array as a set of phase-factor profiles.

137. (Previously Presented) The apparatus of claim 129, wherein the principal-factor determinator comprises a factor analyzer.

138. (Previously Presented) The apparatus of claim 137, wherein the factor analyzer forms a covariance array from the drift-compensated array, applies an eigenanalysis to the covariance array to define a complete set of eigenvectors and eigenvalues, and defines a set of drift-compensated principal factors as a subset of eigenvectors determined by a selector operating on the complete set of eigenvectors.

139. (Previously Presented) The apparatus of claim 138, wherein the selector operates on the complete set of eigenvectors to define the set of drift-compensated principal factors as a first few eigenvectors corresponding to eigenvalues above a certain limiting value.

140. (Previously Presented) The apparatus of claim 129, wherein the principal-factor determinator comprises a linear-least-squares analyzer.

141. (Previously Presented) The apparatus of claim 140, wherein the linear-least-squares analyzer selects a set of initial factors from the set of drift-compensated row vectors of the drift-compensated array, performs a linear-least-squares decomposition with the set of initial factors on the drift-compensated row vectors in the drift-compensated array to provide a set of residue factors, and performs a Gram-Schmidt orthonormalization on the combined set of initial factors and residue factors to provide drift-compensated principal factors.

142. (Previously Presented) The apparatus of claim 129, wherein the profile generator defines a set of drift-compensated target factors on a space of the drift-compensated principal factors determined by a target-factor constructor operating on the drift-compensated principal factors, applies the set of drift-compensated target factors to a profile trajectory lying within a space of drift-compensated principal factors to obtain a sequential set of target-factor weighting factors corresponding to the drift-compensated target factors for the profile trajectory, and outputs to an output device analytical results selected from the group consisting of a set of drift-compensated scaled target-factor profiles derived from the set of target-factor weighting factors, and the set of drift-compensated target factors.

143. (Previously Presented) The apparatus of claim 142, wherein the target-factor constructor generates a profile trajectory on a 3-dimensional projection of a 4-dimensional space of a set of first-four, drift-compensated principal factors along with a reference tetrahedron the vertices of which represent each of the first-four, drift-compensated principal factors; encloses the profile trajectory within an enclosing tetrahedron with vertices centered on end-points and in proximity to turning points of the profile trajectory, and with faces lying essentially tangent to portions of the profile trajectory; and calculates the drift-compensated target factors from the normed coordinates of the vertices of the enclosing tetrahedron in terms of the drift-compensated principal factors.

144. (Previously Presented) The apparatus of claim 143, wherein the target-factor constructor in generating the profile trajectory further calculates 4-space coordinates of a profile trajectory of drift-compensated target-factor profiles on a 4-dimensional space to produce four coordinates for each point in the profile trajectory, one coordinate for each of the first-four, drift-compensated principal factors; reduces the dimensionality of the coordinates of the profile trajectory by dividing each coordinate by a sum of all four 4-space coordinates to produce normed coordinates for the profile trajectory; and, plots the normed coordinates for the profile trajectory in a 3-dimensional space the coordinate axes of which are edges of a reference tetrahedron the vertices of which correspond to unit values for each of the first-four, drift-compensated principal factors in a manner analogous to plotting of coordinates on a quaternary phase diagram.

145. (Previously Presented) An article of manufacture comprising a program storage medium readable by a computer, the medium tangibly embodying one or more programs of instructions executable by the computer to perform a method for compensating a plurality of sequential spectra and profiles derived therefrom for effects of drift, the method comprising:

transforming a plurality of sequential spectra obtained from a spectrometer to provide an array of row vectors compensated for effects of drift of data along an independent variable axis, wherein the array of row vectors compensated for effects of drift of data along the independent variable axis constitutes a drift-compensated array;

performing a principal-factor determination on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis; and,

generating, from a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis, scaled target-factor profiles compensated for effects of drift of data along the independent variable axis.

146. (Previously Presented) The article of manufacture of claim 145 further comprising generating drift-compensated compositional profiles from the set of drift-compensated scaled target-factor profiles.

147. (Previously Presented) An article of manufacture comprising a program storage medium readable by a computer, the medium tangibly embodying one or more programs of instructions executable by the computer to perform a method for compensating a plurality of sequential waveforms and profiles derived therefrom for effects of drift of data along the independent variable axis, the method comprising:

transforming a plurality of sequential waveforms obtained from a waveform-source device to provide an array of row vectors compensated for effects of drift of data along an independent variable axis, wherein the array of row vectors compensated for effects of drift of data along the independent variable axis constitutes a drift-compensated array;

performing a principal-factor determination on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis; and,

generating, from a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis, scaled target-factor profiles compensated for effects of drift of data along the independent variable axis.

APPENDIX OF EVIDENCE FOR APPLICATION NO. 10/077,036

Appellants are unaware of any evidence submitted in this application pursuant to 37 C.F.R. §§ 1.130, 1.131, and 1.132.

APPENDIX OF RELATED PROCEEDINGS FOR APPLICATION NO. 10/077,036

As stated in Section II above, Appellants are unaware of any related appeals, interferences or judicial proceedings.